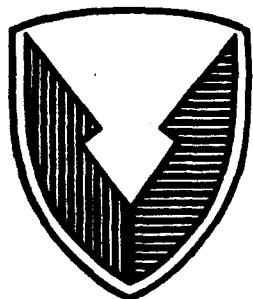


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U.S. ARMY MATERIEL COMMAND

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INDUSTRIAL PREPAREDNESS

SECTOR STUDY

GUIDELINE

MARCH 1990

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Prepared By

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For

U.S. ARMY INDUSTRIAL ENGINEERING ACTIVITY
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SECTOR STUDY GUIDELINE

PREFACE

This study was performed for the U.S. Army Industrial Engineering Activity (IEA). IEA is a staff element of HQ, Army Materiel Command (AMC), under the operational control and technical direction of the Deputy Chief of Staff (DCS) for Production. IEA provides engineering, technical and management services in the production management of assigned items of materiel; executes the production management functions for assigned items; assists the DCS for Production in the production management of materiel items controlled directly by HQ, AMC level; and provides engineering, technical, and management support to the DCS for Production in his role as Executive Director of the Industrial Preparedness Program.

The study was performed by L. Katz-Rhoads of the U.S. Department of Transportation, Research and Special Programs Administration, Transportation Systems Center (RSPA/TSC).

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SECTOR STUDY GUIDELINE

1.0 INTRODUCTION

The goal of Industrial Preparedness Planning is to ensure an orderly and effective transition of the industrial base from a commercial peacetime environment to an emergency support role, with minimum delay or disruption.

The Industrial Preparedness Planning (IPP) Manual¹ describes four acceptable planning methods.

This document provides support for the Sector Study method (see Visual 1). It includes an up-to-date discussion of the function of and problems facing modern sector studies.

Sector evaluations are often dynamic processes which rely on cooperation among the Services, industrial engineers, and economists. Reducing such a complex process to a routine procedure tends to produce results with limited usefulness. Therefore, this guideline recommends methods for standardizing sector study information rather than managing study activities.

Visual 2 is an overview of the proposed Sector Study Guideline (SSG) elements. While this Guideline does not directly address study activities, it does provide support to them. For example, many sector studies are confronted with "fuzzy" problems to study. In this situation, setting study limits or scope is an important task. Section 5 provides a framework for setting operational

- 1. DD FORM 1519 METHOD
- 2. DID METHOD
- 3. DIBP METHOD
- 4. SPECIAL STUDIES METHOD

- A. PRODUCTION BASE ANALYSIS
- B. * SECTOR STUDY
- C. OTHER IPP STUDIES

- 1. Approved Industrial Preparedness Planning Methods.

¹ DOD 4005.3-M

limits. Later during analysis, informed conclusions result from a synthesis of information from many sources. A typical analysis combines industry conditions; study objectives; item/system requirements.

1. IPP PLANNING BACKGROUND
2. FRAMEWORK FOR SETTING OPERATIONAL LIMITS
3. AVAILABILITY OF DATA
4. FINAL REPORT STRUCTURE

2. Overview of Guideline Elements.

This guideline supports analysis by providing:

- (1) a framework for setting operational limits;
- (2) a list of industry topics;
- (3) a list of possible factors to consider within a topic; and
- (4) a list of potential data sources.

Because not all aspects of every study effort are unique, SSG is able to provide cases, examples, and suggestions as appropriate for some typical problem situations. For use during sector analysis SSG provides: 1) practical examples of typical problems and, where possible, sample solutions; 2) examples of situations where military requirements are likely to be unavailable and some methods to estimate this data; 3) typical assumptions for use in peacetime, surge and full mobilization analysis; 4) a discussion of sample surge and mobilization models; and 5) suggestions for documenting information in a standard format.

Since each sector study investigates a unique situation, no guideline can be expected to provide recommendations for every possible situation. Study activities not covered by this guideline will probably include a combination of: 1) scoping and re-scoping the analytical effort; 2) developing a study approach; 3) carrying out sector evaluation; 4) managing study resources.

2.0 GUIDELINE OBJECTIVES

This report is based on the belief that the sector study mission can best be achieved when:

- (1) Study findings are presented in a standard report which will have broad application in Mobilization Planning, Industrial Preparedness Planning and Army Materiel Management.
- (2) All sector studies are organized so that necessary differences in study methods can be easily identified.
- (3) Study rationale and data are documented, so that comparison of factors and parameters in different studies is facilitated.

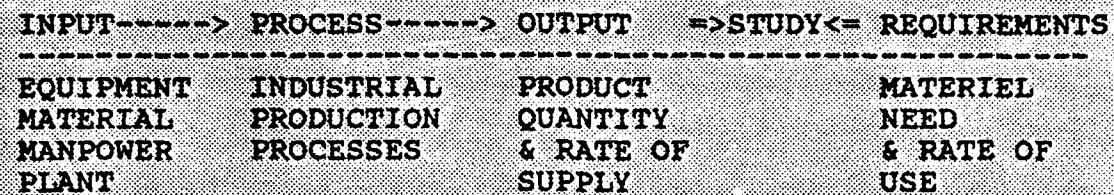
3.0 GUIDELINE METHODOLOGY

The following methodology was used in preparing this report:

- (1) Collection and analysis of completed sector studies;
- (2) Interviews with analysts;
- (3) Comparison of elements in example sector studies;
- (4) Investigation of the context, role, issues, function and history of sector studies;
- (5) Synthesis of examples, guidelines and requirements for each reporting element, based on practice and prior studies.

4.0 IPP PLANNING BACKGROUND

Prior to 1980, a typical study investigated the ability of a sector to meet production requirements of items/systems on the critical items list (CIL). Traditional investigations tended to focus on processes shown in Visual 3. While the process appears



3. Traditional Focus on Sector Production Processes.

straightforward, evaluating the capacity of complex industrial production processes, for manufacturing finished goods/material in the quantity and at the rate required, is not a simple task.

Visual 4 shows some of the factors included in sector evaluation. Each factor may not affect a sector's output capability

PROCESS			
(INPUTS)	(PRODUCTION)	(OUTPUT)	(REQUIREMENTS)
EQUIPMENT	INDUSTRIAL	PRODUCT	MATERIEL
MATERIAL	PRODUCTION	QUANTITY	NEED AND
MANPOWER	PROCESSES	& RATE	& RATE OF USE
PLANT		SUPPLY	

FACTORS			
• SHORTAGES	• CAPACITY	• ITEM	• MIL SPECS
• INVENTORY	• Q.A.	• SYSTEMS	• STOCKPILE
	• PRODUCTIVITY		• PEACETIME
• PRIME CONTRACTORS		• BOTTLENECKS	• SURGE
		• CAPABILITY	• FULL MOB.

4. Factors Often Included in the Scope of a Traditional Study

independently. Because factors are dependent, finding a method for improving one factor may not lead to an increase in material output. For example, an improvement in assembly productivity may not increase output if there is a bottleneck during system test.

4.1 Changes during the last decade

In December 1980, a report by the Ichord Panel, titled "The Ailing Industrial Base: Unready For Crisis", was completed. The release of this report was one of several events which led to a change in the scope of modern sector studies. In particular, this report interpreted the topic of the defense industrial base in a very broad fashion. For example, the following issues were considered relevant: production capacity of prime contractors and subcontractors; manpower shortages; foreign dependency; capital investment; loss of capacity and withdrawal of potential contractors from defense business; contracting procedures; unstable demand; import penetration; shortages of critical materials; unreasonable government regulation; inadequate stockpiles; economic interdependence; tax laws; and the decline in productivity.

As Roderick L. Vawter stated in his book², "the issues of skilled manpower shortages, dependence on foreign sources for raw materials, productivity growth rates, and low capital investment, go much beyond the defense establishment in their impact on the economy. The Ichord panel approach is appropriate, nevertheless, because the defense industrial base will tend to mirror the economic health of the entire base and, in the event of mobilization, would be constrained by the larger problems of the base."

During the 80's, other relationships were added to the growing list of factors relevant to defense industrial base planning. One example is the relationship between surge capability, lead time and basic capacity. Surge requires an increase in production in a fairly short period of time. Industry increases production by

² Industrial Mobilization the Relevant History, National Defense University Press, Fort Lesley J. McNair Washington D.C. 20319 1983 Page 70.

using more manufacturing capacity and more material. But, by definition, the quantity of long-lead items cannot be increased in a short period. Therefore, manufacturing processes that depend on long-lead items cannot quickly expand or surge their capacity. Visual 5 shows how changes in perception of the defense industrial base have led to an increase in the number and complexity of potential sector study topics.

This same broader sense of the industrial base is, also, found in a 1980 Report of the Defense Science Board Summer Study Panel on Industrial Responsiveness³. This report pointed out specific areas for study, e.g., lead time increases caused by raw material shortages, such as titanium sponge; inadequate capacity related to large backlogs in specialty metals fabrication; small buys of electronic components and subsystems; very limited sources for specialty items, such as optical components, bearings, and electrical connectors; increasing complexity and sophistication of parts, testing, and qualification requirements. Many of these topics were subsequently investigated.

Today, industrial preparedness planning must evaluate a more complicated industrial situation than was formerly necessary. This situation, combined with increasing use by DoD and contractors of off-the-shelf products typically not covered by the DD form 1519 method, the DID method or the DIBP method, makes the special studies method an increasingly valuable approach to Industrial Preparedness Planning. Visual 5 shows how recent changes translated into an increase in the number of topics that fell within the scope of a sector investigation.

³ Office of the Under Secretary of Defense for Research and Engineering, Report of the Defense Science Board 1980 Summer Study Panel on Industrial Responsiveness.

PROCESS (INPUTS)	(PRODUCTION)	(OUTPUT)	(REQUIREMENTS)
EQUIPMENT	INDUSTRIAL	PRODUCT	MATERIAL
MATERIAL	PRODUCTION	QUANTITY	NEED
MANPOWER	PROCESSES	& RATE OF	& RATE OF
PLANT		USE	USE

FACTORS

• SHORTAGE	• CAPACITY	• ITEM	• MIL SPECS
• INVENTORY	• Q.A.	• SYSTEM	• STOCKPILE
• PRIME CONTRACTORS		• BOTTLENECKS	• PEACETIME
• SUBCOMPONENTS		• CAPABILITY	• SURGE
			• FULL MOB.

ACCELERATED PRODUCTION

(INPUTS)	(PRODUCTION)	(OUTPUT)	(REQUIREMENTS)
• LONG LEAD	EXISTING	SURGE	SURGE
• MATERIAL	INDUSTRIAL	OUTPUT	ACCELERATION
• MANPOWER	CAPACITY	RATE	RATE
• TEST EQUIP			• COST
• TOOLING	• PR. DUCTIVITY		• ENERGY
• COMPOSITES	• PRODUCT COMPLEXITY		• TRANSPORTATION

THE INDUSTRIAL BASE

• PRIME CONTRACTORS	• SUBCONTRACTORS	• PURCHASE BACKLOG
• POTENTIAL CONTRACTORS	• CAPITAL INVESTMENT	• SUBSTITUTES
• LAID AWAY PLANT	• INNOVATION	• COMMERCIAL SUPPLIERS

POLICY ISSUES

• NUMBER OF SOURCES	• REGULATION	• CONTRACTING PROCEDURES
• COPRODUCTION	• TESTING	• REQUIREMENTS
• SERVICE WIDE USE	• TAX LAWS	• OFFSET AGREEMENTS
		• USE OF OFF-THE-SHELF PRODUCTS

ECONOMIC AND FISCAL ISSUES

• FOREIGN DEPENDENCY	• ECONOMIC TRENDS	• IMPORT SHARE
• RETURN ON FIXED ASSETS	• PRODUCTIVITY	• INTERDEPENDENCE
• MANUFACTURERS' SHIPMENTS	• INVESTMENT RATIO	• CAPACITY
• GROWTH	• PROFITABILITY	• MONETARY EXCHANGE RATE

5. Modern Sector Study Topics.

5.0 FRAMEWORK FOR SETTING OPERATIONAL LIMITS

Setting operational limits is the process of translating study goals and objectives into an analytical problem of practical proportions. Dividing sector studies into market groups is a technique which can be used to support the process of setting operational limits.

5.1 Market Groups

The framework divides all industrial sectors into six industry market groups according to percent of output sold to DoD and the complexity of the product, as shown in Visual 6.

% SOLD TO DoD		100% MILITARY MARKET GROUP A	50%+ MILITARY MARKET GROUP B	50%- MILITARY MARKET GROUP C
PRODUCT				
SIMPLE		A1	B1	C1
COMPLEX		A2	B2	C2

6. Market Group Classification.

Market group A produces only for military use. The output of industrial sectors in group A may be simple items (A1), such as a raw material, or very complex systems (A2), as is the case of nuclear submarines. Market Group B produces primarily for military use, but also has a civilian market. Products from Market Group B sectors may be simple items or complex systems, e.g., (B1) specific bullets or (B2) surveillance equipment. Market Group C sectors split production between military and civilian consumers, but lean toward civilian buyers. Again, the product may be simple

or complex, e.g., (C1) tires, or (C2) computer products.⁴

As Visual 7 indicates, Market Group classification can be used to guide the application of scarce study resources, to give a qualitative sense of a study schedule, and to provide a first cut estimate of the level of effort needed.

1. APPROACH DEVELOPMENT
2. SCOPE DEFINITION
3. RESOURCE MANAGEMENT
4. LEVEL OF EFFORT ESTIMATE
5. DATA AVAILABILITY EST.

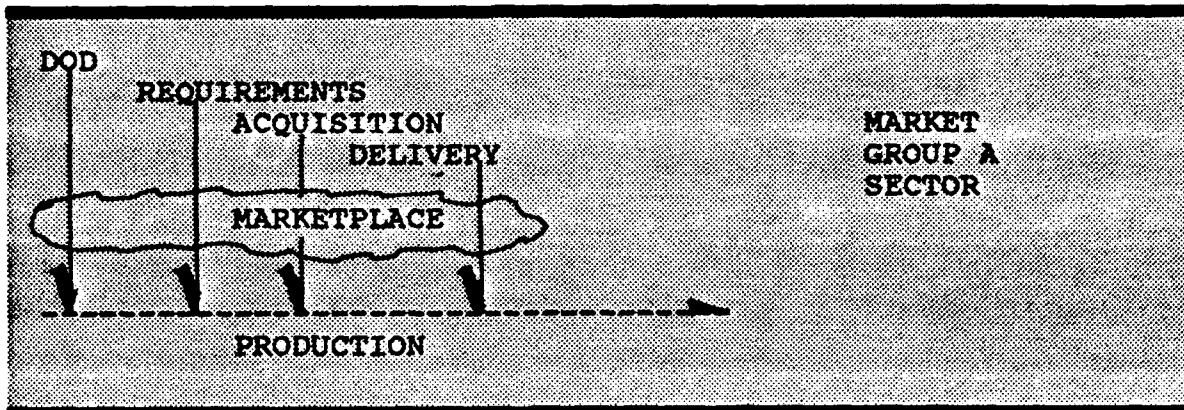
7. Study Activities Affected By Market Group Classification.

5.2 Market Group A and the Level of Effort (LOE) Assessment

Classifying a sector study by its market group should provide a qualitative indication of the problem(s) a study effort may need to overcome. If, for example, a sector study is investigating an A Market Group (100% sold to DoD), it is possible to say: (1) for both A1 and A2 situations, it is likely that the only competition among consumers occurs within the military, and (2) an A1 industry is producing a simple item which has few components. Furthermore, it is possible to predict that during study evaluation: (3) A1 subcontractors are not likely to be a major study issue (the product is a simple item); (4) A1 and A2 information sources will be potentially adequate and easy to identify; (5) military specs are likely available; (6) military requirements for the product are available; (7) the study will evaluate a critical item; (8) established contracting procedures will probably exist; (9) government regulation will probably exist; (10) the sector probably submits 1519 reports.

⁴ Market Group Classification is not the same as the Standard Industrial Classification (SIC) used by the Department of Commerce. The SIC is used to classify industries based on the product or service produced.

Because there are many suppliers and effectively one buyer in a Market Group A, the role of marketplace activities is limited. When a sector sells 100% of its output to DOD, the Department of Defense can influence sector production capacity and capability.



8. The Role of the Marketplace Is Limited and DOD Can Directly Influence Production Decisions.

5.3 Market Groups B and Level of Effort (LOE) Assessment

Market Group B includes industries that sell more than half of their output on average to DoD. Many initial studies of Market Group B activities are "Quick Reaction" and/or limited in their scope. Thus, it is important to find methods to maintain reporting excellence and reduce the level of effort required.

It may be possible to design a study, such that it takes advantage of anomalies within a particular sector. For example, within a sector, an individual supplier may be large or small and may supply their total output or smaller percentage to DOD. It may be possible to identify individual suppliers that are selling more than the Market Group B average to DOD, in the short term. An application of this type can be seen in "The Tungsten Stockpile Requirements for Army Needs Study". This study, by design, excluded suppliers with both commercial and military buyers choosing instead to focus on four mines dedicated to military

production. By limiting the study scope, the investigation moved from a B Group to an A Group level of effort. Clearly, this process should consider many factors, particularly study objectives. Sector anomalies that are useful in setting operational limits are most likely to occur in Market Group B.

In general, study level of effort for Market Group B is greater than Market Group A. The " Gas Turbine Engine (GTE) Production Base Analysis Study", which reported 1987 GTE sales as 54% DoD, 44% Commercial and 2% foreign military, is an example of a Market Group B2 study.

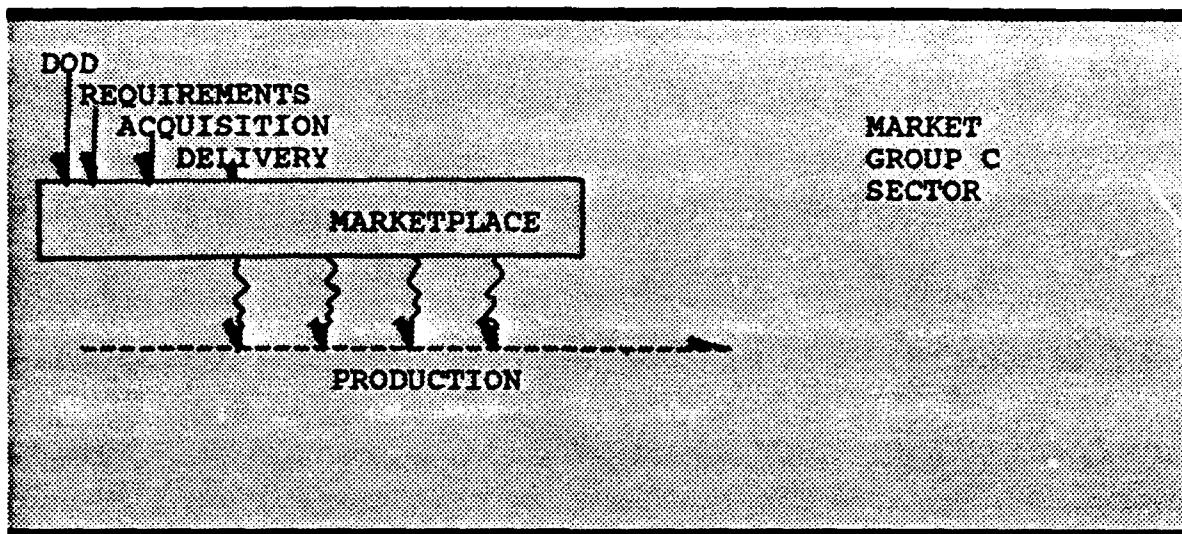
5.4 Market Group C and the Level of Effort Assessment

Market group C sells a small proportion of its output to DoD. Some example of the products in Market Group C are optical components, bearings, electrical connectors and computer chips. Since these products are used by prime contractors and subcontractors in their manufacturing equipment as well as in CIL items or systems, Market Group C suppliers can be described as indirect DoD suppliers or critical suppliers or both. Traditional sector studies did not investigate Group C suppliers. However, the trend for modern sector studies has been to focus more and more on suppliers that provide less than half their output to DoD.

Visual 9 illustrates the intervening role of the marketplace for Market Group C Contractors. In the Market Group C case, where there are many suppliers and many buyers, DOD cannot directly influence production decisions.

5.5 Market Groups A1, B1, C1 versus A2, B2, C2 (LOE)

Investigating a sector which produces a simple item (A1, B1, C1) may be thought to be much easier than investigating a sector



9. The Role of the Marketplace is Important in Market Group C Production Decisions. .

producing a complex system (A2, B2, C2). However, the complexity of the product or manufacturing process does not appear to be the critical factor in determining the level of effort needed for a study. Instead, the level of effort appears to be determined by the availability of information. For example, it is easier to evaluate a complex system with known requirements than to investigate a simple item with unknown requirements.

6.0 AVAILABILITY OF INFORMATION

Information needed to understand the relationship between sector output and military materiel and delivery needs changes for each analysis period (peacetime, surge, and full mobilization) and it changes for each Market Group, as Visual 10 shows.

Consider the case of a supplier of commercial off-the-shelf products (Group C) provided to DOD under a standard purchase order. It is likely that there are no Defense Contract Management Command quality assurance procedures, no surge or mobilization clauses in the purchase order, and no military requirements for reporting 1519 type information. Since the system is usually not critical,

RELATIONSHIP BETWEEN SECTOR OUTPUT AND MILITARY MATERIEL

■ DURING THE PEACETIME PERIOD WHEN FREE MARKET CONDITIONS PREVAIL AND MILITARY SPECS/REQUIREMENTS ARE NOT DEVELOPED FOR ALL ITEMS/SYSTEMS.

GROUP A 100% SOLD TO DOD

GROUP B 50% OR MORE SOLD TO DOD

GROUP C 50% OR LESS SOLD TO DOD

■ DURING SURGE WHEN DOD DEMAND INCREASES BUT IT'S ABILITY TO INFLUENCE PRODUCTION DOES NOT INCREASE.

GROUP A 100% SOLD TO DOD

GROUP B GREATER THAN 50% SOLD TO DOD

GROUP C RESPONDS TO MARKET DEMAND RATHER THAN DOD.

■ DURING FULL MOBILIZATION WHEN IT IS OFTEN ASSUMED THAT MILITARY PRIORITIES WILL DOMINATE AND FREE MARKET PROCESSES MAY BE SUSPENDED.

GROUP A PROVIDES AT CAPACITY AS NEEDED

GROUP B PROVIDES AT CAPACITY AS NEEDED

GROUP C PROVIDES AT CAPACITY AS NEEDED

10. A Goal of a Sector Study is to Evaluate the Relationship Between Sector Output and Military Materiel Needs.

military requirements and MIL-SPECS have probably not been developed. Also, this type of supplier probably does not have any procedure for working with DoD acquisitions or production base planning and is not necessarily able to participate pro-actively in a sector study. Clearly an investigation that needs just basic industrial production data and military requirements will need to innovate in this situation. Visual 11 shows the twelve information ingredients necessary for a study.

Title VII authority of the Defense Production Act ensures production data will be provided by industry, but there is no guarantee that military requirements data will be available. Requirements for Market Group A and portions of Market Group B are often available from DOD, because products manufactured by these

	PEACETIME	SURGE	FULL MOBILIZATION
PRODUCTION CAPACITY	X	X	X
PRODUCTION RATE	X	X	X
REQUIREMENTS	X	X	X
RATE OF USE	X	X	X

11. Twelve Information Ingredients Needed to Evaluate a Sector.

sectors have been identified as critical or important to national defense. However, Market Group C contains many products not currently recognized as critical to national defense. A study which fails to study requirements or demand for sector output may have difficulty evaluating the military significance of a sector. A study that cannot relate delivery requirements to sector output should clarify the sector's contribution to the national defense, by some other means.

Typically the Services conduct sector studies to determine the manufacturing capability and capacity of either industry sectors or commodity sectors. These studies are intended as a complement to the vertical approach used in Industrial Preparedness Planning. Recently, some sector studies have investigated parts of the industrial base which indirectly affect the supply of critical items/systems. When a sector study investigates a sector that 1) provides products that are indirectly related to critical items and 2) is, also, not directly affected by DOD needs e.g., Market Group C, evaluation becomes very complex. The nature of the problems which a sector study often investigates has led modern sector studies to go far beyond traditional analysis of manufacturing flow of material. However, all studies continue to reflect a common mission, i.e., the evaluation of military significance by the realistic determination of mobilization requirements and a

realistic determination of production capability and capacity to fulfill requirements.

A study, at minimum, needs the following six types of data from industry or DoD:

- (1) peacetime data about industry;
- (2) peacetime DOD requirements;
- (3) industrial surge capability;
- (4) DOD surge requirements;
- (5) industrial mobilization capability; and
- (6) DOD mobilization requirements.

	PEACETIME DATA FROM INDUSTRY	DOD	SURGE DATA FROM INDUSTRY	DOD	FULL MOB. DATA FROM INDUSTRY	DOD
GROUP A	/	/	/	*	/	*
GROUP B	/	*	/	*	*	*
GROUP C	/	*	*	*	*	*

Data which can be supplied by industry. /

Data often available within DOD. *

Data usually estimated during sector analysis. *

12. Sources of Essential Sector Study Information.

The likely availability of these six data types depends on the Market Group being studied. The estimates show in Visual 12 reflect the following assumptions: 1) that defense industrial contractors in Market Group A and portions of Market Group B are knowledgeable about DOD needs for information and are prepared to provide data to a sector study; 2) indirect suppliers with no contractual obligation to operate as a defense contractor, Market Group C, are willing to provide data, but are not particularly

knowledgeable about DOD needs for information; 3) requirements for items/systems identified as important to national defense exist within DOD and would be made available to a study; 4) requirements for items/systems not officially recognized within DOD probably do not exist and cannot be provided to a study; and 5) it is both reasonable and feasible, within the context of a study to estimate information which is not available. Visual 12 indicates studies of Market Group A industries will probably be able to find data, while studies of Market Group C industries will probably need to develop estimates.

7.0 OVERVIEW OF THE PROPOSED SECTOR STUDY REPORT FRAMEWORK

The objective of this guideline and hopefully all future sector studies should be to organize the final report in a manner that supports cross reference among different studies and within a single study.

REPORT COMPONENTS
1. NARRATIVE DISCUSSION
2. DOCUMENTING THE ANALYSIS
3. APPENDIX

The proposed report framework is divided into three components as shown in Visual 13. It will be discussed generally in this section and in detail later.

Within each report component there are many possible topics and topic headings. Unfortunately, topic headings currently are not clearly defined. Thus, prior sector study reports are inconsistent in this regard. This guideline presents a set of standard headings.

The concept of standard headings is straightforward, implementing them may not be. Consider the impact of standardizing the topic "background". Some reports discuss the background of sector industrial conditions; other reports discuss background events such

as high level requests for sector information and some studies discuss study project management under the heading "background". This guideline gives separate names (background, mandate, and project management) to each existing interpretation of "background". If future studies choose to discuss background, mandate, and project management as separate topics, the typical reporting effort for one topic, e.g., "background", could increase threefold.

7.1 Narrative.

This part of a sector study should strive to present a synthesis of all findings relevant to the sector's military significance. If study conclusions indicate a sector provides important, essential or critical materiel and if deficiencies are identified then the study should present recommendations for methods to improve conditions.

1. DESCRIBE SECTOR CAPACITY AND HOW CAPACITY WAS ESTIMATED
2. DESCRIBE REQUIREMENTS OR HOW REQUIREMENTS WERE ESTIMATED
3. SUMMARIZE THE SECTOR'S CAPABILITY
4. RECOMMEND METHODS TO IMPROVE PERFORMANCE

14. Narrative Functions.

7.2 Reporting the Analysis

This section contains the rationale for and methods used during a sector investigation.

1. PEACETIME ANALYSIS
2. SURGE ANALYSIS
3. MOBILIZATION ANALYSIS
4. ADDITIONAL TOPICS

15. Four Areas Where Study Efforts Should be Documented.

7.3 Appendices

This section contains actual inputs used during a sector investigation.

- QUESTIONNAIRES
- RAW DATA
- REFERENCES
- INTERVIEWS
- TESTIMONY
- FIELD NOTES

16. Examples of Typical Appendix Items.

8.0 NARRATIVE GUIDELINES

The narrative section of a sector study reports the study findings. A sector study narrative should be about 10 to 20 pages long and contain the topics shown in Visual 17. Many narrative sections are written as a single discussion without explicit topic headings.

Visual 17 is a list of topics not headings. Explicit headings are recommended for use in study documentation.

- 1. STUDY MANDATE
- 2. INDUSTRY BACKGROUND
- 3. PROJECT MANAGEMENT
- 4. STUDY GOALS
- 5. STUDY OBJECTIVES
- 6. STUDY SCOPE
- 7. STUDY ASSUMPTIONS
- 8. ANALYSIS METHODS
- 9. STUDY CONCLUSIONS
- 10. STUDY RECOMMENDATIONS

17. Narrative Topics.

8.1 Study Mandate

For the purpose of the guideline, mandate is defined as "a clear instruction, authorization, direction or justification for performing the study". Examples of mandate are shown in Visual 18.

- 1. Prior studies have identified a problem.
- 2. Qualitative changes in the sector have been noted.
- 3. Service requirements have to be satisfied.
- 4. Support in developing service wide solutions to shortfalls is required.
- 5. Significant changes in capacity have occurred.
- 6. New technology and/or products are available.

18. Mandate Examples.

8.2 Industry Background

Topics relevant to sector background and the study mandate are often confused. The narrative can include both types of data. Visual 19 shows examples of typical industry background topics.

1. INDUSTRY EVOLUTION
2. INDUSTRY MODERNIZATION
3. PRIOR SECTOR STUDIES
4. INDUSTRY TECHNOLOGY
5. PRODUCT MIX
6. FINANCIAL RESOURCES
7. MARKET TRENDS
8. HUMAN RESOURCES

19. Examples of Typical Background Topics.

8.3 Reporting Management of Study

In the past, sector studies have been performed by Army and representatives from other Services, The Defense Logistics Agency, the Department of Commerce and the Canadian Government. Participation in a study should be reported, appropriately.

8.4 Recommended Study Strategic Goal

It is recommended that the strategic goal of all sector studies be to assess the potential military significance of a sector. A sector may be a significant factor to military readiness, but not to the nation's economy. Conversely, an item or system may enjoy a significant commercial position, but make little or no contribution to national defense. A sector is significant to the national defense if a shortfall in current or future output would substantially impede achieving national security goals.

8.5 Recommended Study Tactical Objectives

Study objectives are much more specific than study goals. In practice, a sector study is motivated by strong indications that sector conditions pose a significant problem. As can be seen in

Visual 20, study objectives may arise for many reasons and as Visual 21 indicates reflect a wide variety of concerns. In the context of a sector study, the topics listed in Visual 5 translate into study objectives such as the ones in Visual 21.

- RESULTS FROM PRIOR STUDIES
- LIMITED STUDY RESOURCES
- LIMITED STUDY SCHEDULE
- EXPERT KNOWLEDGE

20. Motivation Behind Study Objectives.

1. ASSESS AN INDUSTRY'S HEALTH
2. EVALUATE THE IMPACT OF A POLICY ON PRODUCTION
3. PROVIDE DATA FOR THE DoD AUTOMATED DATA BASE
4. COORDINATE DATA COLLECTION AND REPORTING
5. ESTABLISH OR UPDATE INDUSTRY CAPACITY BASELINE
6. EXTEND OR UPDATE MULTI-SERVICE REQUIREMENTS
7. COORDINATE ACQUISITION ACTIVITIES
8. VERIFY INDUSTRIAL OVERSIGHT ACTIVITIES
9. INVESTIGATE THE IMPACT OF REGULATION
10. IDENTIFY LONG LEAD TIME SUBSYSTEMS AND COMPONENTS

21. Examples of Tactical Objectives.

8.6 Guidelines for Study Scope

The scope is the set of issues defined by the study team as relevant to mission goals and objectives. While each sector study team decides how much emphasis to place in each area, the issues identified in Visual 22 are often part of the scope. In general,

1. MANUFACTURING PROCESSES
2. PRODUCTION TECHNOLOGY
3. PEACETIME CAPACITY
4. PEACETIME REQUIREMENTS
5. SURGE PRODUCTION
6. SURGE REQUIREMENTS
7. MOBILIZATION CAPACITY
8. MOBILIZATION REQUIREMENTS

22. Critical Study Issues.

relevant issues should be characterized⁵ during the analysis process and reported appropriately in the narrative. Visual 5 presented a list of important topics often included in the narrative.

8.7 Typical Assumptions

There is a set of typical planning assumption that many studies utilize. In order to highlight unique sector conditions, some assumptions are adjusted and additional assumptions are adopted. Important assumptions used during sector evaluation should be highlighted in the narrative. Visual 23 lists some assumptions.

1. Sector resources are limited to the USA and Canada..
2. Public support is positive.
3. Mobilization is defined as Full Mobilization.
4. U.S. and Canadian industrial bases are undamaged.
5. Surge begins on the first day of the FY being planned.
6. M-day occurs on the first day of the FY being planned.
7. Full mobilization will be sustained for 2-3 years.
8. Economies of scale are expected as production increases.

23. Typical Assumptions.

8.8 General Discussion of Methods

The methods used to gather and analyze sector information are unique to each study. They include standard types of methods such

⁵The notion of characterization is used here because it applies to the problem of studying complex processes which occur in dynamic situations. To characterize a study element means to describe the major parts of the static attributes, such as plant, equipment and inputs and characterize dynamic attributes, such as the sector's current competitive position or future trends.

as the list in Visual 24 and rules of thumb such as the example in Visual 25. The narrative should include a summary of these activities.

1. Data collection methods
2. Data verification methods
3. Analysis methods, models and transformations.

24. Examples of Method Types.

Quantify objectives where possible and use an empirical approach when necessary.

25. Example of a Rule of Thumb.

8.9 Narrative Conclusions

Conclusions and recommendations should be the main focus of the narrative. In general, a sector study responds to similar types of questions, e.g.,

- (1) Do sufficient quantities of a material or product exist to meet peacetime delivery requirements?
- (2) In the event of an emergency, will there be a sufficient amount of the product available in time to meet a military buildup?
- (3) In the event of full mobilization, will there be sufficient product available to meet military delivery needs on time?
- (4) Based on the analysis of the particular industrial sector, what are the conclusions about the sector's capability?
- (5) What are the historic, industrial, and economic trends?

8.10 Narrative Recommendations

The purpose of recommendations are to ensure the sector capability and capacity are adequate to meet defense requirements for modernization, readiness, sustainability and expansion under peacetime, surge and mobilization. Visual 26 is a list of past

strategic level sector study recommendations. The list is presented here in order to illustrate the types of recommendation which have been considered strategic. Visual 27 is a list of some tactical level sector study recommendations. A sector study should not limit itself to the recommendations shown in visuals 26 or 27.

INCREASE PRODUCTION CAPACITY
REDUCE POST S/M DAY LEADTIME
IMPROVE ECONOMIC VITALITY
INCREASE PRODUCTIVITY
IMPROVE QUALITY
PLANT MODERNIZATION
ACQUISITION REFORM
CORRECT DEFICIENCIES
ACCELERATE PRODUCTION
INCREASE REPAIR CAPACITY

26. Examples of Strategic Level Recommendations

MANAGEMENT OPTIONS

- A. Use process and control initiatives to reduce cost and increase quality and efficiency of manufacture and repair processes.
- B. Develop improved production techniques.
- C. Award "pilot line" contracts.
- D. Establish a standby production line.
- E. Prestock raw materials, components, etc..
- F. Multi-year contract.
- G. Train personnel in critical skill areas.
- H. Recommend engineering design changes.
- I. Reduce oversight and bureaucratic hierarchy.
- J. Reduce paperwork oversight bureaucracy of acquisitions
- K. Reduce uneconomic lot buys
- L. Modernize or expand facilities.
- M. Introduce tracking and monitoring plans.
- N. Implement an Industrial Preparedness Measure (IPM).
- O. Use the Manufacturing Technology (MANTECH) Program.
- P. Use the Industrial Modernization Incentives Program (IMIP).
- Q. Standby waivers to Peacetime Federal Acquisition

27. Examples of Tactical Level Recommendations.

9.0 GUIDELINE FOR DOCUMENTING THE ANALYSIS

The process used to transform data into information which supports evaluation of the sector's military significance is discussed in

the following pages.

In general, if all the information on Visual 28 were available, then an assessment of the sector's capacity and capability should be possible by comparing peacetime sector manufacturing output and timeliness with peacetime military requirements; and surge capacity to surge requirements, and so on. However, the analysis by comparison method is limited because there is not enough information to identify the cause(s) of shortfalls or factors that introduce delivery delays.

	PEACETIME	SURGE	MOBILIZATION
PRODUCTION (P)	OUTPUT	OUTPUT	OUTPUT
REQUIREMENTS (R)	MATERIEL	MATERIEL	MATERIEL
ANALYSIS	IS P<R ?	IS P<R ?	IS P<R ?
IF P<R THEN ADDITIONAL DATA IS NEEDED TO FIND THE CAUSE			

28. Comparing Sector Production to Requirements is Not Enough.

Use of a simple comparison between estimated production quantity/delivery schedule and requirements can be an effective indication of the magnitude of sector readiness or lack of readiness. However, a simple comparison does not indicate how robust sector capability would be in the face of events, such as innovation, changes in policy or foreign competition. For this reason, a typical sector study often collects data on many more topics than are shown in Visual 28. Not only does a sector study require more information than is indicated in Visual 28, it needs the information in a form that supports analysis.

It is important that the data used and estimated during analysis be well documented. If this is done and future conditions require

re-evaluating a sector, there may be enough information to adapt current studies for the future needs. Therefore, every sector study should make an effort to meet the study objectives and provide documentation that future studies can quickly adapt.

Decisions of how to do a sector study must reflect the unique context of study resources and objectives. Reporting study information and investigation methods should be consistent for all studies. In order to facilitate consistent reporting, the sequence of topics in Visual 29 is recommended. Additional topics should be added as appropriate.

Guidelines in this section are aimed specifically at supporting the process of documenting the analysis process and the information used to support conclusions. Guidelines are presented in the sequence outlined on the following page. Supporting documentation includes many of the same topics contained in the narrative, but with a different focus.

9.1 PEACETIME BASELINE

Within the context of a study it is the function of the peacetime investigation to establish a knowledge baseline of the production infrastructure. Once a baseline is established, it is possible to assess the sector's capacity and capability to meet peacetime requirements and provide input to surge and mobilization.

9.1.1 Overview of Peacetime Conditions

In a sector study, the overview section records general information about the sector and its relationship to DoD. Some examples of relevant data might be common industry problems or recent trends. The narrative contains overview data, but not in the detail reported in this section. Peacetime conditions are often

1. PEACETIME BASELINE.
 - 1.1 Overview of Peacetime Conditions.
 - 1.2 Relevant Peacetime Industry Topics.
 - 1.3 Peacetime Industry Data Gathering Methods.
 - 1.4 Sources of Industry Data.
 - 1.5 Peacetime Assumptions.
 - 1.6 Data Transformations.
 - 1.7 Availability of Peacetime Requirements.
 - 1.7.1 Requirements Provided by Sponsor.
 - 1.7.2 Requirements Developed Within the Study.
 - 1.8 Peacetime Analysis and Conclusions
 - 1.8.1 Military Significance
 - 1.8.2 Potential Deficiencies
 - 1.8.3 Foreign Dependence
2. SURGE INFORMATION
 - 2.1 Surge Assumptions
 - 2.2 Availability of Surge Requirements
 - 2.2.1 Requirements Provided By the Sponsor
 - 2.2.2 Requirements Developed Within the Study
 - 2.3 Surge Analysis.
 - 2.3.1 Production Data and Analytical Results
 - 2.3.3 Economic Data and Analytical Results
3. FULL MOBILIZATION INFORMATION
 - 3.1 Mobilization Assumptions
 - 3.2 Availability of Mobilization Requirements
 - 3.2.1 Requirements Provided By the Sponsor
 - 3.2.2 Requirements Developed Within the Study
 - 3.3 Mobilization Analysis.
 - 3.3.1 Production Data and Analytical Results
 - 3.3.3 Economic Data and Analytical Results
4. ADDITIONAL FACTORS RELEVANT TO SECTOR EVALUATION.

29. Outline of Topics that Should Be Documented.

considered "standard" operating conditions. One objective of this section might be to define what "standard" is for the sector.

9.1.2 Relevant Peacetime Industry Topics

A manufacturing structure relates an item/system to its various

1. Which manufacturing plants will be studied?
2. On what basis will a facility be included in the study?
3. Were manpower shortages found to be a problem?
4. Was lack of capital found to be a problem?
5. Are there enough contractors?
6. Are contracting procedures causing delays?
7. What are the demand forecasts, long term and short term?
8. What is the extent of foreign penetration of the market?
9. Is dependency on foreign suppliers a problem?
10. Are there shortages of critical items?
11. Are there other kinds of shortages?
12. What is the nature of government regulation?
13. What is the impact of government regulation?
14. Is economic interdependence among sectors relevant?
15. Does one service use this sector more?
16. Do the services compete for sector output?

30. Examples of Possible Industry Topics.

subsystems, components, parts and materials. Manufacturing Structures Methodology is a tool for relating end-item requirements to component parts and raw material and for investigating topics such as the ones shown in Visual 30.

9.1.3 Peacetime Industry Data Gathering Methods

A study should report the method(s) it uses to gather data. Visual 31 is a list of commonly used methods.

1. INDUSTRY MANAGEMENT INTERVIEWS
2. USE THE DEFENSE PRODUCTION ACT TO COLLECT DATA
3. REVIEW INDUSTRY LITERATURE
4. REVIEW PREVIOUS SERVICE REPORTS/STUDIES
5. REVIEW RECOMMENDATIONS OF INDUSTRY EXPERTS
6. VISIT MANUFACTURING PLANTS
7. REVIEW INDUSTRY CONTRACTS WITH DoD.

31. Peacetime Industry Data Gathering Methods.

9.1.4 Sources of Industry Information

The actual sources used by a study should be clearly reported. The list of sources shown in Visual 32 may be helpful.

1. Internal analysis by the Services.
2. Internal briefings by the Services.
3. Studies by Professional organizations within the industry
4. Commissioned studies done by academia.
5. Department of Commerce competitive assessment reports.
6. DOC International Trade Commission investigations.
7. Presidential Directives.
8. Congressional recommendations or reports.
9. Statements by industry leaders, organizations or unions.
10. Media reports.
11. DoD databases e.g., JCS, ASP, AFLC, FEMA, ASC.
12. Studies done by Universities.
13. Shipments to Federal Agencies Survey Report by DOC.
14. Defense Economic Impact Modeling System.
15. Annual Survey from Dunn and Bradstreet.
16. Standard Industrial Classification by DOC.
17. Logistics Management Institute (LMI).
18. National Defense University
19. DOT Research and Special Programs
Administration/Transportation Systems Center.

32. Potential Sources of Industry Information.

9.1.5 Peacetime Assumptions

Putting data in an appropriate form is an important step during analysis. The methods used to transform data into information useful to sector analysis should be reported. Sometimes simplifying assumptions are made in order to speed the investigation or because information is not available. For example, one manufacturing facility may be selected. Capacity estimates developed for a selected facility may be used as a basis for estimating total sector capacity by assuming the selected facility is typical of the sector.

9.1.6 Data Transformations

Often data are available in a form unsuitable for analysis. This can happen, for example, in the case of a commodity sector such as tires, where information about production is described in pounds of raw material processed rather than in tires output per year. In order to estimate the rate tires will be available to meet military needs, it is necessary to transform pounds input to units output. This transformation may take into account many factors such as loss during production, short shelf life, and quality assurance tests.

Sector capacity is another aspect of peacetime analysis that may require transformations. Sometimes capacity is estimated on the basis of detailed analysis of the manufacturing process. In this situation, choosing the manufacturing steps to include and estimating their "flow rate" may require transformations and assumptions. For example, in the case of subassemblies used in a system, it may be necessary to transform the rate of subassembly output into an estimated rate of subassemblies available for input to a final system. Losses may include delays from transit and alternative subassembly uses such as for spares or in a stockpile.

Data transformations and analytical assumptions often occur simultaneously. Where feasible and appropriate, separate supporting documentation is recommended.

9.1.7 Availability of Peacetime Requirements

Information about military requirements can be provided to a study, or developed within the study.

9.1.7.1 Requirements are Provided by Sponsor

If requirements are provided it would be helpful if:

- (1) Units of production are the same as units of requirements;
- (2) Specifications are provided; and
- (3) The manufacturing delivery rate and rate of use are given.

9.1.7.2 Requirements Developed within the Study

Situations where explicit peacetime requirements are not available are frequent. However, peacetime requirements are often implied. For example, sector output which is not listed as critical may be related to a CIL for which there are requirements. Visual 33 is a list of four relationships between sector output and materiel requirements which can be used as a basis for approximating DOD requirements.

1. It may be possible to approximate requirements, if the sector provides a sub-component of a critical Item/Systems.
2. It may be possible to approximate requirements, if the sector provides products used in many different critical Item/Systems.
3. It may be possible to approximate requirements, if the sector provides products used in the manufacture of Items/Systems or
4. It may be possible to approximate requirements, if the sector provides products used in the manufacture of subcomponents, components or parts of an Item/System.

33. Relationships Potentially Useful for Estimating DOD Requirements.

Developing military requirements for sector output is a separate analytical sub-process within the total sector study. The overall study scope should explicitly report this sub-process, if it is undertaken. If possible, documentation should contain a sub-section with the following topics:

9.1.7.2.a Peacetime military requirements discussion:

Goals, objectives, scope, assumptions, methodology, estimated initial supply, spares and delivery rate.

9.1.7.2.b Peacetime military requirements analytical process:

Information, factors, data gathering methods, inference methods, and analytical procedure.

9.1.8 Peacetime Analysis and Conclusions

Analysis, in the context of a sector study, ties all the relevant factors together. If for example plant, equipment, labor and capital have been identified as relevant factors, then the analysis procedure should use these factors to logically draw conclusions about the sector's peacetime production and peacetime capacity. Typically, sector studies use more than one analysis procedure. Assessing sector short term peacetime capability may be done by a simple comparison of production rates and usage rates, while long term assessment may use predictive procedures. Not all analysis need be quantitative. In some cases, qualitative information may be used. In other cases, the same set of data can be aggregated differently to expose different aspects of sector capability.

9.1.8.1 Peacetime Analysis and Military Significance

It should be the goal of sector analysis to reduce vague or complex conditions to a simple relationship or sequence of relationships.

In this context, an analyst should choose relationships which illuminate the sector's military significance.

9.1.8.2 Peacetime Analysis of Potential Deficiencies

There are several types of deficiencies that may be of concern in a sector study and should be documented in the report. Potential material deficiencies could result in manufacturing production delays that lead to materiel shortages. If potential shortages exist at peacetime levels of sector output, the sector may be constrained in adapting to changes in requirements whether under future peacetime conditions or under surge or mobilization conditions.

The sector study may have evaluated the lead times for inputs to the production process. Long lead times need not be a problem during periods of relatively constant demand for the sector products. The firms in the sector could have established procedures for ordering inputs in sufficient time to support the production process. Most firms would also have safety stocks to handle brief increases in demand. However, long lead times make it difficult for a sector to respond quickly to significant increases in demand. Understanding the pattern of lead times for a sector and the firms' typical inventory practices, e.g., whether the sector maintains safety stocks or relies heavily on just-in-time inventory practices, provides data on the sectors ability to meet future peacetime demands. This information is also critical to the surge/mobilization assessments.

Visual 34 shows how production is constrained by the use of long lead time inputs to the production process.

Visual 35 shows how production output is affected by bottlenecks in the manufacturing process. The manufacturing process itself may

include weak spots or bottlenecks which tend to limit the output rate. Bottlenecks act not on the speed with which a sector can respond but on the rate of output the sector can achieve. Once a bottleneck is reached in the production process, the absolute rate of output is constrained regardless of the amount of advance notice given.

In peacetime, Market Group A may react to manufacturing delays in one manner while Market Group C may respond in another; for example, Market Group C may use substitutes which Market Group A often cannot do.

9.1.8.3 Peacetime Analysis of Foreign Dependence

The Joint Logistics Commanders' 1986 report, A Study of the Effect of Foreign Dependency, defined a foreign dependency as an immediate, serious logistic support problem that affects the combat capability of the United States because of the unavailability of a foreign sourced item.

In order to evaluate whether an item meets this criterion, a study should consider the relationship of the foreign sourced item to combat items/systems. If a study is investigating a critical system component, then the relationship of the item to the system and the system to combat capability has been established. However, these links may not be available for an investigation of a Market

Group C product.

9.2 Surge and Mobilization Information

The sector study should report on the assessment of the analyzed sector to meet surge and mobilization requirements. Surge is defined in AR 700-90 as "the ability of the industrial base to rapidly meet accelerated production requirements of selected items with existing facilities and equipment in a peacetime environment. Only existing peacetime program priorities will be available to obtain materials, components and other industrial resources necessary to support accelerated production requirements." Full Mobilization is defined in JCS PUB21 as "mobilization by the Congress of the Reserve component units in the existing force structure, all individual, standby, and retired reservists; retired military personnel; and the resources needed for their support for the duration of the emergency plus six months to meet the requirements of a war or other national emergency involving an external threat to the national security."

The report may document the assessment separately for both surge and mobilization, as recommended in Visual 29. Since much of the relevant industrial data may have been gathered in the process of preparing the peacetime baseline and would be reported on under that section of the report, the sections on surge and mobilization may focus on the aspects of the sector that are important to determining its capability to respond to national defense needs.

In practice, the sequence of events known as Surge/Mobilization (or Surge/Mob or S/M) is analyzed jointly as a series in which surge may lead to full mobilization or terminate without going to full mobilization. Although Surge and Full Mobilization are defined and there is a time independent decision making process by which surge can lead to mobilization, Surge/Mobilization is not

formally defined. Thus the analyst must rely on the stated definitions in assessing surge/mob. The documentation of the analytical results could still be presented separately for surge and for mobilization.

9.2.1 Surge/Mob Assumptions

Perhaps the most difficult aspect of undertaking a sector study is the determination of the requirements that may be imposed upon the sector under emergency conditions. For the peacetime assessment, analysts have current operations to look to for information about the requirements for the sector's product and the ability of the sector to meet the total demand. Since the specific emergencies the nation may be called to address are unknown, hypotheses about the emergency requirements that may confront the sector must be made. This is one part of the industrial production planning process.

Industrial preparedness planning begins with National Defense Goals and ends when an industrial firm develops production plans and specifies the production inputs needed to satisfy a part of that goal. Visual 36 shows the information flows.

National Defense goals establish the objectives of the defense planning process. Possible emergency scenarios are simulated to assess the ability of the nation to achieve the



defense goals under a variety of situations. Although sector studies are part of the defense planning process, they typically occur after emergency scenarios are simulated and analyzed. In theory the simulations provide information on the demand for materiel that the industrial sectors must provide. Some applications of simulated emergency scenarios are to prioritize missions, sequence force deployment, assess risk and estimate the Planned Force level. The Planned Force is the level required to provide reasonable assurance of successful execution of the national defense strategy. The Planned Force is sized for a specific emergency scenario⁶ which is not constrained by fiscal, manpower, logistic, mobility, basing or similar limitations.

Within DOD, emergency scenario simulation analysis activities and Materiel Requirements are separate organizational functions. The simulations output demand for materiel which is input to activities responsible for developing realistic materiel requirements. The materiel requirement activities set program priorities and specific material requirements. The Materiel Requirements function uses Planned Force level information as input. Requirements activities are different from the planning activities discussed above because they use factors such as fiscal, manpower, logistic, mobility, basing, production capacity, and capability; to develop a realistic determination of requirements and a realistic determination of production capability and capacity to fulfill requirements. Four organizational areas where requirement functions occur within DOD are Industrial Preparedness Planning, Requirements development, Logistics and Acquisitions.

⁶ The Scenario is presented in the Joint Strategies Planning Document Supporting Analysis Part I and is keyed to the projected threat in the last year of the planning period (that is, the FYPD plus 4 years).

The specific materiel requirements that result from the Materiel Requirements function are inputs to the assessment of the importance of the marketplace in supporting or constraining the ability of the specific sector in meeting the national defense goals.

The market demand is an input to the assessment of the production capability of the sector. The manufacturing function is to take production inputs such as raw materials, plant, or manpower and output products such as combat items/systems useful in the national defense. The process is often very complex. However, the peacetime assessment, documented above, provides the baseline for the surge/mob analysis.

Sector studies usually do not investigate every component listed above, but they often make assumptions about components not investigated. For example, studies of Market Group A sectors often assume market economy factors are not relevant. While making this assumption is valid practice, such an assumption should be recorded.

The actual assumptions used by a study should be clearly reported. Visual 37 is a list of commonly used surge assumptions.

- 1. No added plant or equipment during Surge.
- 2. Production ratio of systems to spares remains constant.
- 3. Present national industrial priorities and allocation legislation shall be in effect (Title I of the DPA, reference (1)).
- 4. Sales ratio of commercial to military remains constant.
- 5. No drawdown of stockpiles.
- 6. Increase production to 2 8-hour shifts 5 days a week.
- 7. Mobilization level will be constant for 2-3 years.
- 8. Increased production of complex systems may take a year.
- 9. Increased production of simple items may take 6 months.

37. Examples of Surge Assumptions.

9.2.2 Availability of Surge/Mob Requirements

Information about surge/mob materiel requirements can be provided to a study, or developed within the study. However, a specification of requirements is critical to the study, and properly documenting the requirements used in the analysis is necessary.

9.2.2.1 Surge/Mob Data Provided by the Study Sponsor

Sometimes surge requirements are provided by the sponsor. However, they may not be in the form appropriate for all studies. For example, sometimes information on the required production rate of materiel is provided. If the study is investigating a combat system, such as a vehicle, this data is in the form needed by the study. However, if the study is investigating tires for combat vehicles, the study will need to estimate requirements for tires based on the given demand for vehicles.

9.2.2.2 Surge/Mob Requirements Developed within the Study

Situations where explicit Surge/Mob requirements are not available are frequent. The following sections discuss two approaches used to solve this problem.

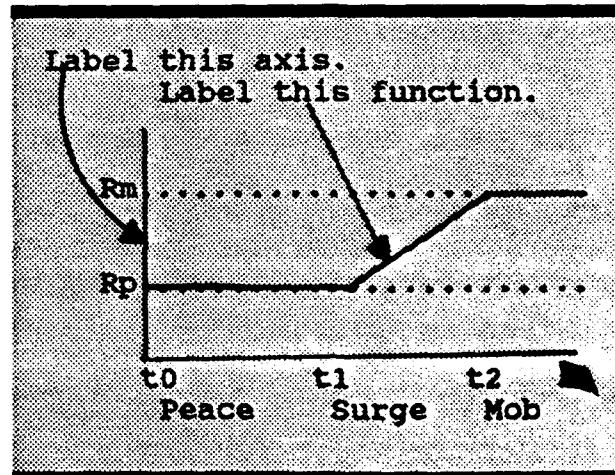
The first strategy is to use emergency scenario simulation results as a basis for requirements. The problem with this approach is that the scenario simulation model is usually not available. In addition, the process of developing realistic requirements from scenario output is time consuming. A technique which some experienced production base planners use is to assume an underlying scenario and focus on the materiel requirements implied by the assumed scenario. Typically this ad hoc effort has not been recorded, but should be.

Another strategy is to assume a requirements model and proceed from there. Three Materiel Requirements Models are discussed in the following section. They were chosen for illustrative purposes because they seem to reflect common practice. It is not necessary to use one of these models, but it is important to document the model chosen.

9.2.2.2.1 Surge/Mob Linear Requirements Model

In a linear requirements model, it is assumed that consumption of materiel accelerates to full mobilization demand. The mobilization level is assumed to remain constant or linear for 2 -3 years.

During peacetime the rate of materiel use is relatively constant (linear), during surge materiel consumption increases (linearly), until a maximum or mobilization level of need is reached. In a general sense, this is a reasonable first approximation of many real world events. However, in the case of any one particular sector, this model may not be useful.

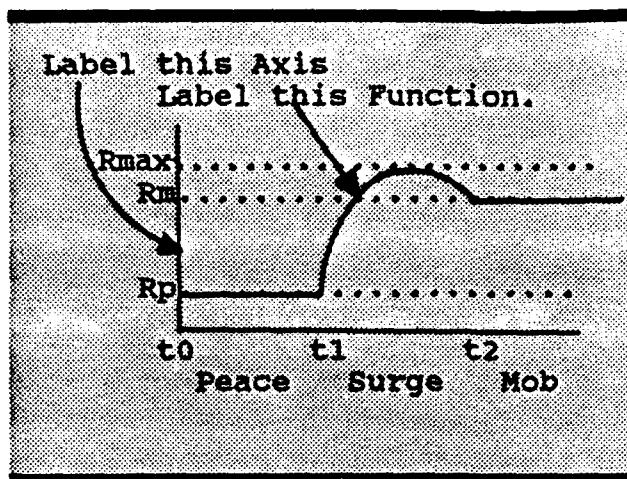


38. Linear Requirements Model.

In the real world, linear events are rare and the linear models are recognized as unrealistic. However, it is reasonable practice to begin an analysis with a linear model because it provides a good first order approximation and it "works". Often during analysis, more realistic factors are used to adjust a simple linear model. Also, a linear model may predict the magnitude (is it big or small) of a situation well enough to satisfy sector study objectives.

9.2.2.2.2 Non-Linear Model

Visual 39 is a non-linear Requirements Model. In this model only the character of surge is non-linear. Demand for materiel during surge rises dramatically, reaching it's peak well above non-linear mobilization use of materiel.



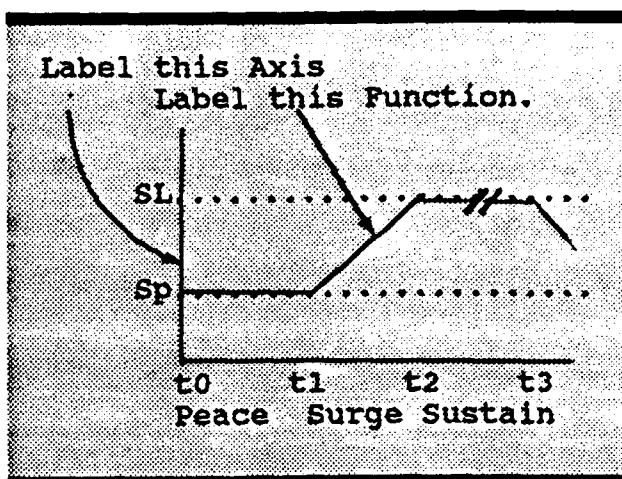
39. Non-Linear Requirements Model.

The parameter R_p describes the rate at which materiel is required during peacetime (from t_0 to t_1). During this period, the production rate is constant. During surge, the rate materiel is needed rises steeply until it reaches R_{max} at time t_2 . Later R_{max} falls until it reaches R_m . R_m is a constant level of mobilization which continues for 2 to 3 years. Actual world events often display non-linear behavior. Using a non-linear model adds complexity and is not necessary for every sector study. Linear and non-linear requirements imply different total requirements for materiel and at dramatically different production rates.

9.2.2.2.3 Surge-Only Requirements

Visual 40 is another model of Surge/Mob requirements. For the purposes of this discussion it is called the "Surge Only" requirements model. This model represents materiel requirements associated with the short term emergency actions for which it is clear that full mobilization will not be required. A "Surge Only" requirement represents an acceleration of materiel consumption from (Sp) peacetime rates during the period t_0 to t_1 up to a surge level (SL) during the period t_1 to t_2 . At maximum surge (SL), the

required production rate is constant for an indeterminate time period (t_2 to t_3). At some time (t_3) surge decelerates from maximum surge production rate (SL) to a new peacetime level (Sp'). The Sp' level may be above, below or equal to the original peacetime production rates. Maximum surge deployment levels (SL) are usually assumed to be less than maximum mobilization deployment rates (R_m), but the difference between R_m and SL is unclear.



40. Surge Only Requirements Model.

9.2.3 Surge and Mobilization Analysis

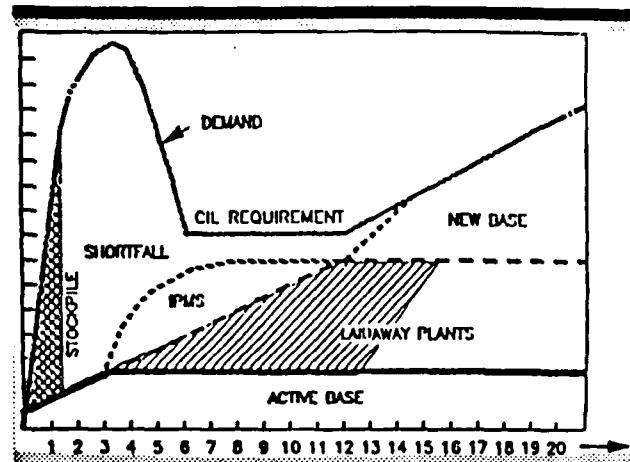
Although no precise guideline can be given, it is important to document data, assumptions and inference methods employed during analysis. This section provides supporting documentation for the sector assessments, recommended remedies, and study conclusions cited in the narrative.

9.2.3.1 Reporting on Production Data and Analysis

There are several ways of reporting the findings of the analysis of surge and mobilization capabilities. Materiel deficiencies occur when emergency resources are not adequate to effectively provide for the national defense. In Visual 41, shortfall is the space between materiel delivered (supply) and materiel needed (demand).

Some management options that can be used to reduce a shortfall are:

- (1) accelerate the production rate of the sector (Surge);
- (2) use stockpiles;
- (3) mobilize laidaway plant;
- (4) implement IPM's; and
- (5) use commercial base.

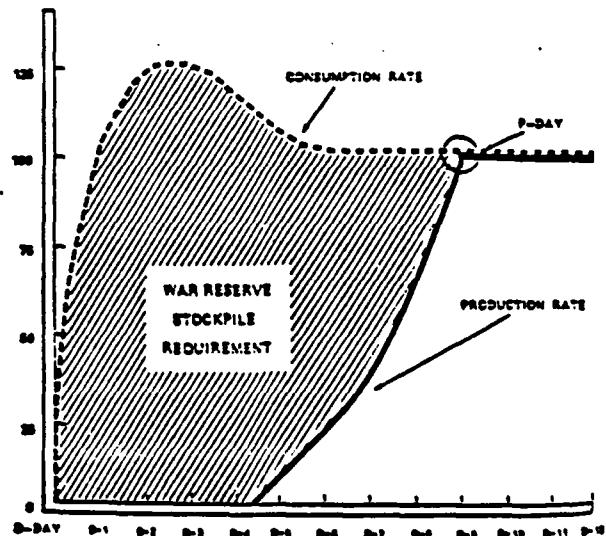


41. Options that may reduce a Shortfall.

The relative impact of implementing these options is not the same for all sectors.

In particular, many items/products are not being stockpiled, plants are not laidaway for many sectors and demand for sector output is not the shape of the demand/per unit time described in Visual 41. Material deficiencies can cause materiel deficiencies, but the connection is not always one for one. For example, a vehicle may require 8 tires to make it combat ready. Therefore, a sector production shortfall of 64 tires would translate into a materiel deficiency of 8 vehicles.

Another way of presenting the results of the analysis is to use the D to P Concept. This technique compares consumption rate to production rate from (D-Day) the start of the war to the point (P-Day) where industrial base production rate could satisfy requirements. In operational terms the D to P concept meant the acquisition of adequate war reserves to last



42. D to P Concept.

until the industrial base could build production to satisfy consumption. As Visual 42 shows, shortfall between consumption and production defines the reserve needed. Throughout the 1960s and 1970s DOD programmers were instructed to use the D to P Concept in computing war reserve requirements for everywhere except Europe. The concept was the basis by which the Services budgeted for end-items and production base facilities. In the mid 1970s, the D to P concept was decoupled from the War Reserve Stockpile and stockpiles were computed on the basis of a fixed number of days. The D to P concept has since been used as a logistic planning tool. In this role, D to P is the method in which the gross materiel readiness requirement is the amount needed to support the approved forces at planned wartime rates for conflicts of indefinite duration. This requirement is to be satisfied by a balanced mix of assets on hand at D-day and by assets to be produced from D-day through P-day. At P-day the planned rates of production deliveries to the users equals the wartime rate of expenditure (consumption).

9.2.3.2 Reporting on Economic Data and Analysis

On July 15, 1988, the Under Secretary of Defense (Acquisition) released the final report, Bolstering Defense Industrial Competitiveness, to the Secretary of Defense. This report includes a definition of defense-critical industries and an assessment of these industries overall economic performance, both of which were based on a quick reaction report done by the Logistics Management Institute (LMI)¹.

- Defense Critical Industries were defined by LMI as those in which

¹ Industrial Preparedness Manual Dod 4005.3-M and JCS 1

² The report Identifying Industrial Base Deficiencies was undertaken for the Department of Defense Under Secretary of Defense (Acquisition) by the Logistics Management Institute, 1988.

the majority of DOD's budget is spent, directly or indirectly, as well as industries that the military Services consider vital to defense production. Visual 43 is a list of the economic indicators used. According to LMI, import share is the primary indicator of U.S. competitiveness. It is defined as the ratio of imports to apparent domestic consumption (domestic production plus imports minus exports). Capacity growth is the second most important indicator of an industry's health. The measure of capacity that LMI selected is practical capacity, that is, the maximum level of production possible with the equipment in place and a realistic work schedule. The activity in each industry is calculated using Manufacturers shipments. A negative or low growth in this indicator demonstrates slow demand growth, that may lead to reduced investment and capacity growth. Industries undertake capital expenditures to maintain or expand productive capacity and to improve productivity. Investment ratios are measured by capital expenditures as a percentage of shipment values. Productivity is measured by shipments per worker in constant dollars. Profitability is another indicator of the health of an industry. Sufficient profitability enables industries to attract new investment capital, relieve pressure on wages and salaries, and sustain research and development expenditures.

- 1) Import Share
- 2) Capacity Growth
- 3) Manufacturers shipments
- 4) Capital Expenditure
- 5) Productivity Growth
- 6) Profitability

43. Economic Indicators of Industrial Performance

The Government Accounting Office (GAO) commented on LMI's report, saying' on Page 1 "The LMI analysis represents an initial step in identifying American industries that are critical to the defense industrial Base," and on page 6 "LMI's study did not attempt to

'Industrial Base Defense-Critical Industries Briefing Report to the Honorable John Heinz, U.S. Senate by GAO August 1988

take into account the relative importance of the various industries in terms of national security requirements. Establishing priorities would further sharpen the definition of the critical defense industrial base. According to LMI, industries for which poor performance is indicated are possible candidates for government "intervention", but only after the government performs a thorough industry analysis of national security requirements and individual industry capability to meet these requirements."

An understanding of a sector's economic health is important to decision makers because proposed remedies to possible shortfalls in the provision of a defense item may include intervention into the market. When the market place is not functioning independently to maintain adequate capability to support national defense requirements, it may be feasible for DOD directly to intervene¹⁰

- (1) to keep vital facilities or suppliers in business;
- (2) to train selected suppliers in the furnishing of critical supplies and services, to prevent the loss of their ability and employee skills, or to maintain active engineering, research, and development work;
- (3) to maintain properly balanced sources of supply in the interest of industrial mobilization;
- (4) to limit competition for current acquisition of selected suppliers or services approved for production planning under the IPP to producers who have IP agreements for those items or to limit award offerors who agree to enter into IP agreements for those items; and
- (5) to create or maintain the required domestic capability for production of critical supplies by limiting competition to items manufactured in the United States or Canada.

¹⁰DOD 4005.3-M

However, justifying candidates for government intervention or predicting the impact of intervention is difficult and should be documented.

9.3 ADDITIONAL FACTORS RELEVANT TO SECTOR EVALUATION

This section should document those aspects of the study that do not fall under the previous sections. In particular, this section should provide documentation on the unique data, process, or assumptions used during the sector investigation that support the recommendations cited in the narrative.

10.0 GUIDELINE APPENDICES

The following list provides examples of selected studies and reports that discuss agencies' actions, proposals, and views on Industrial Preparedness Planning and, in particular, evaluation of a sector's military significance.

1) 1950

The Defense Production Act

2) 1983

Industrial Mobilization: The Relevant History, by Roderick L. Vawter. An Industrial College of the Armed Forces Study in Mobilization and Defense Management National Defense University Press

3) December 31, 1984

Resource Management: An Historical Perspective, Contract # mw-83-C-1388, for the Federal Emergency Management Agency

4) April 18, 1985

Department of Defense Instruction Number 4005.3

5) June 1985

A New Approach to Mobilization Planning: Case Study of MK 46 Torpedo Production, CRM 85-39.10/ Center for Naval Analysis Naval Planning, Manpower and Logistics Division

6) July 1985

Tungsten Stockpile Requirements for Army Needs by the U.S. Army Industrial Base Engineering Activity

7) August 1985

An Industrial Mobilization Handbook for Government. Office of the Assistant Secretary of Defense for Acquisition and Logistics, U.S. Department of Defense

8) November 26, 1985

Department of Defense Directive Number 4005.1

9) May 22-23, 1986

The Future Role Of Mobilization in National Security, Proceedings Fifth Annual Mobilization Conference, Industrial College of the Armed Forces of the National Defense University.

10) June 18, 1986

Joint Logistics Commanders Bearing Study

11) September 30, 1986
Surge and Mobilization Study Review Briefing to the Joint Logistics Commanders

12) October 1986
Precision Optical Components Federal Acquisition Regulation (FAR) Assessment, U.S. Army Armament Research Development and Engineering Center.

13) February 1987
Gas Turbine Engine (GTE) Production Base Analysis, Study Final Report, Contract # F33657-85-D-2191 Task, 0001, for Aerospace Industrial Modernization Office, Air Force Systems Command.

14) March 15, 1987
Improving Intergovernmental Mobilization Planning: Preliminary Indcon System, Office of the Assistant Secretary of Defense, Acquisition and Logistics (PS/IR), Department of Defense.

15) March 1987
Testimony by Dr. Paul Freedenberg, Undersecretary for Export Administration, Department of Commerce, before the Subcommittee on Defense Industry and Technology, Senate Armed Services Committee.

16) March 1987
Identifying Industrial Base Deficiencies, by the Logistics Management Institute for the Department of Defense

17) April 7, 1987
The Office of the Assistant Secretary of Defense Memorandum, Subject: Updating the Industrial Preparedness Planning Program Dad 4005 Series Regulations

18) April 15, 1987
Machine Tool Industry Study, by the U.S. Army Industrial Base Engineering Activity

19) April 1987
Army Investment Casting Industry Report, by the U.S. Army Industrial Base Engineering Activity.

20) June 15, 1987
Department of the Army Headquarters, U.S. Army Material Command Memorandum, Subject Surge: Mobilization Planning

21) June 19, 1987
Joint Logistics Commanders Precision Optics Study

22) August 3, 1987
Mobilization, JCS Pub 5-01, The Joint Chiefs Of Staff

23) 1987

The Defense Industrial Base Review, Minister of Supply and Services, Government of Canada.

24) March 30, 1988

Department of the Army, U.S. Army Industrial Engineering Activity Memorandum, Subject: Information Paper on Sector Studies.

25) September 1988

Strategic and Critical Materials Report to the Congress, by the Department of Defense.

26) August 1988

United States General Accounting Office Briefing Report to the Honorable John Heinz, U.S. Senate, Industrial Base: Defense-Critical Industries, GAO/NSIAD-88-192BR.

27) December 2, 1988

Department of the Army Headquarters, U.S. Army Material Command Subject: Implementation of Industrial Preparedness Planning with Industry Using Test AMC Form 2819

28) November 1989

United States General Accounting Office Report to the Chairman, Subcommittee on Legislation and National Security, Committee on Government Operation, House of Representatives, Industry Base: Adequacy of Information on the U.S. Defense Industrial Base, GAO/NSIAD-90-48.

29) February 1990

Tire Sector Study: Industrial Resources for Mobilization within the Tire Industry, for U.S. Army Rock Island Arsenal, Illinois, by the U.S. DOT, Research and Special Programs Administration, Transportation Systems Center.